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PII: S1572-3089(23)00075-X

DOI: https://doi.org/10.1016/j.jfs.2023.101175

Reference: JFS101175

To appear in: *Journal of Financial Stability*

Received date: 23 January 2022
Revised date: 4 August 2023
Accepted date: 15 August 2023

Please cite this article as: Mohammad Amin and Victor Motta, The Impact of Corruption on SMEs' Access to Finance: Evidence Using Firm-level Survey Data from Developing Countries, *Journal of Financial Stability,* (2023) doi:https://doi.org/10.1016/j.jfs.2023.101175

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The Impact of Corruption on SMEs' Access to Finance: Evidence Using Firm-level Survey Data from Developing Countries

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August 2023

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Abstract

The present paper estimates the impact of bureaucratic corruption on access to finance for small and medium enterprises (SMEs) in the manufacturing sectors of 79 developing countries. Corruption can make it difficult for businesses to obtain financing by reducing profits, increasing credit demand, increasing the likelihood of bankruptcy, creating uncertainty about future profits, and exacerbating the asymmetric information problem between borrowers and lenders. Consistent with this viewpoint, our findings show that corruption significantly increases the likelihood of a manufacturing SME being financially constrained. A one standard deviation increase in the prevalence of corruption leads to a 3.5 to 4.9 percentage point increase in the likelihood or probability of a manufacturing SME being financially constrained. In countries with credit bureaus and more freely functioning credit markets, the increase in the likelihood of being financially constrained due to higher corruption is much smaller. We argue and provide evidence that these heterogeneities stem from the specific ways in which corruption affects SMEs' access to finance. Thus, the heterogeneities help to raise confidence against the omitted variable bias and reverse causality concerns with our estimation. We also find that higher corruption makes it more difficult for SMEs to access finance in more competitive product markets, as well as for small compared to medium-sized firms. The findings have important policy implications for anti-corruption initiatives, financial development, and the level of competition in product markets.

Keywords: Corruption, Finance, SMEs, Bribery

JEL Codes: D22, D73, G30, O16

The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.
We would like to thank Jorge Luis Rodriguez Meza, the Editor, and two anonymous Reviewers for providing very useful comments. All remaining errors are our own.
We thank the Enterprise Analysis Unit of the Development Economics Global Indicators Department of the World Bank Group for making the data available.

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1. Introduction

The negative impact of corruption on private firms and a country's economic development is a critical issue for both academics and policymakers. Numerous studies have shown that corruption hinders a country's growth and development (see Shleifer and Vishny, 1993; Mauro, 1995; Wei and Shleifer, 2000; Méon and Sekkat, 2005; d'Agostino et al., 2016; Cieslik and Goczek, 2018). There is evidence that corruption reduces firm growth (Fisman and Svensson, 2007; Mendoza et al., 2015; Amin and Soh, 2022; Colonnelli and Prem, 2022), as well as growth-enhancing activities such as innovation (Paunov, 2016; Xu and Yano, 2017). Corruption slows growth by taxing private activity, diverting resources to rent-seeking activity, increasing uncertainty about investment returns, increasing expropriation risk, and lowering public service quality. Another viewpoint holds that corruption is beneficial because it speeds up an otherwise slow and unresponsive bureaucracy (Leff, 1964; Lui, 1985; Dreher and Gassebner, 2013). Regardless, the majority of research indicates that corruption is harmful.

Another strand of the literature emphasizes the significance of firm access to finance for firm growth and overall economic development (Ayyagari et al., 2021; Banerjee and Duflo, 2014; Didier et al., 2021; King and Levine, 1993). Lack of finance impedes day-to-day operations, slows investments, prevents funds from being reallocated to more productive uses, and discourages entrepreneurship and new firm entry. Inadequate financing is a more serious problem for small and medium enterprises (SMEs) in developing countries (Beck et al., 2008; Beck and Demirgüc-Kunt, 2006; Şeker and Yang, 2014). SMEs play an important role by creating jobs, encouraging entrepreneurship, and promoting a more equitable income distribution.

According to recent firm-level studies, corruption may have a negative impact on firms' access to finance (Blackburn and Sarmah, 2006; Qi and Ongena, 2019; Ullah, 2020; Wellalage et

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al., 2020). This is a significant development given the importance of finance for firm performance and the high level of corruption in many developing countries. Corruption can obstruct firms' access to finance and tighten their financial constraints in a variety of ways (see Section 2 for details). Briefly, corruption tightens firms' financial constraints by reducing profits, increasing uncertainty about future returns, lowering the return on investments, making it more difficult for financial institutions to control borrower risk and recover loans, and exacerbating the informational asymmetry problem between borrowers and lenders. If corruption does indeed tighten the financial constraints of SMEs, it implies that corruption has a far greater negative impact on the economy than previously thought. It also implies new policy options (discussed below). However, there are few firm-level studies on the corruption-finance nexus. Further, the existing studies have significant limitations, including limited geographical coverage, the use of perception-based and partial measures of corruption and access to finance, and insufficient exploration of the underlying mechanisms and the moderating role of financial institutions such as credit bureaus.

The current paper focuses on bureaucratic corruption (henceforth, "corruption") involving private firms paying bribes to obtain a specific list of government services. These services include obtaining an electricity connection, a water connection, a construction permit, an import license, an operating license, and paying taxes. We estimate the effect of corruption on the likelihood or probability of a SME being financially constrained. Higher levels of corruption, according to our findings, increase the likelihood of a SME being financially constrained. A one standard deviation increase in the prevalence of corruption leads to a 3.5 to 4.9 percentage point increase in the likelihood of a SME being financially constrained. As expected, more freely functioning credit markets, improved information sharing through credit bureaus, and lower product market competition mitigate the negative impact of corruption on firms' access to finance. Finally, we

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discover that corruption makes it more difficult for small firms to obtain financing than it does for medium-sized firms. Throughout, poorer access to finance and tighter financial constraints are used interchangeably.

We contribute to the related literature in a variety of ways. First, we use firm-level survey data from 79 developing countries that is comparable across countries and time. To the best of our knowledge, there has been no other firm-level study on the corruption-finance link with global coverage. Furthermore, existing studies do not indicate whether the findings apply to countries that were not included in the sample. Second, to the best of our knowledge, this is the first paper to use experience-based corruption measures to estimate the corruption-finance relationship. Previous firm-level research had all used perception-based corruption measures. The perception-based measures rely on the opinions of firms or experts about corruption and have several limitations (see UNODC, UNDP, and the UNODC-INEGI, 2018; Fan et al., 2009; Svensson, 2003; Amin and Soh, 2021).

Third, we employ a thorough and experience-based measure of the firms' financial constraints. This is determined by whether the firms applied for a loan last year, why they did not apply, and the outcome of the loan application. Similar measures have been used in the literature, but not in studies of corruption. At best, corruption studies use partial measures of finance, such as whether a firm has an overdraft facility or a line of credit (see Wellalage et al., 2020) or the firms' perceptions or opinions about whether finance is an obstacle to their operations (see Ullah, 2020). The study by Wellalage et al. (2019) is the sole exception. However, this study only looks at five South Asian countries, with over 70 percent of the firms sampled coming from a single country, India.

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Fourth, we go beyond previous research by emphasizing the role of credit bureaus, as well as more efficient and free-flowing credit markets, in mitigating the negative impact of corruption on firms' financial constraints. The main implication is that financial development, in the form of better creditor information availability and more efficient credit allocation, may act as a partial check on corruption. This is especially important in countries where it is difficult to control corruption directly.

Fifth, we show that higher corruption tightens firm financial constraints more in more competitive product markets, where firms struggle to pass on the cost of corruption to consumers. As a result, we argue that anti-corruption policies are even more important in countries and sectors that have more competitive product markets. Sixth, we pay close attention to endogeneity issues. We take into account all time-invariant country-specific factors (country fixed effects), which are a major source of omitted variable bias in cross-country studies. We use the average level of corruption experienced by all firms in a country-year pair instead of a firm's own experience with corruption. The exercise reduces the possibility of reverse causality, measurement errors, and omitted variable bias influencing estimation significantly. To further raise our confidence against reverse causality and omitted variable bias concerns, we rely on the strategy proposed by Rajan and Zingales (1998) and used in several studies (see Nunn, 2007; Buccirossi et al., 2013). This strategy entails investigating the heterogeneous effects of corruption on a firm's access to finance that are unlikely to hold with other omitted factors or if there is reverse causality in the estimation. The heterogeneous effects we explore are how corruption's impact on firms' financial constraints varies with the presence of credit bureaus in the country and the freedom with which credit markets operate. To the best of our knowledge, the Rajan and Zingales (1998) strategy has not been used in research on the relationship between corruption and finance.

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2. Conceptual framework

In this section, we review the theoretical arguments for how corruption affects firms' financial constraints, how credit bureaus and more freely functioning credit markets mitigate the impact of corruption, and the drivers of firms' financial constraints. The goal of the discussion is to motivate our main testable hypotheses and the controls used in the regressions.

2.1 *Corruption and access to finance*

The literature suggests that corruption affects firms' financial constraints in a variety of ways. First, bribe payments act as a tax on businesses, increasing their costs, decreasing profits, and increasing the likelihood of bankruptcy. With lower profitability and a higher risk of bankruptcy, lenders are forced to limit lending to the relatively more profitable firms, and only the more profitable firms are willing to take loans (see Blackburn and Sarmah, 2006; Wellalage et al., 2019; Ullah, 2020). As a result, corruption tightens firms' financial constraints.

Second, related to the preceding point, the risk of expropriation and lower return on investment as a result of corruption cause private firms to invest less in physical capital and innovation activity (Mauro, 1995; Méon and Sekkat, 2005; Paunov, 2016; Xu and Yano, 2017). Thus, corruption reduces firms' long-term growth prospects and, as a result, limits their access to finance.

Third, bribe payments are clandestine in nature. Favors received in exchange for bribes are unpredictable and frequently shrouded in secrecy. Bribery thus increases the informational asymmetry between borrowers and lenders regarding the firms' true profitability. As a result, credit market imperfections worsen, and firms have a more difficult time obtaining financing. Bribery

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also increases uncertainty about firms' profitability. Increased uncertainty can make it more difficult for businesses to obtain financing (Alessandri and Bottero, 2020; Arellano et al., 2019).

Fourth, judicial corruption raises uncertainty because courts cannot always enforce loss recovery from defaulting debtors, and as a result, banks refrain from lending (Bae and Goyal, 2009; Weill, 2011).[1] The corruption measures we use do not directly address judicial corruption. Nonetheless, this type of corruption may still have an impact on our findings if bribe-paying firms are perceived as better connected and more likely to bribe the judiciary (see Qi and Ongena, 2019).

One caveat to the preceding arguments is that corruption can "grease the wheels" of a slow bureaucracy, helping firms grow. If this is true, it implies that corruption could ease firms' credit constraints by increasing profits, improving returns on long-term investments, encouraging growth-enhancing activities such as innovation, and reducing uncertainty about future income. Nonetheless, most studies view corruption as harmful to firm performance and growth. We follow this viewpoint in our discussions below. Summarizing the discussion so far, we have the following testable hypothesis.

Hypothesis 1: Corruption increases the chance or likelihood of a SME being financially constrained.

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2.2 *Role of information sharing and efficient credit markets*

Next, we consider some predictions about the heterogeneous effects of corruption on firm financial constraints. The heterogeneous effects considered are specific to how corruption affects firms' financial constraints. As a result, there is no obvious reason for the heterogeneous effects to hold

[1] Also see La Porta et al. (1997) for how weak investor protection laws and their poor enforcement harm bank lending.

in the data if either our corruption variable is a proxy for omitted factors or our estimations have a reverse causality problem. Testing for the heterogeneous effects is thus a useful check against omitted variable bias and reverse causality problems. The same approach is used by Rajan and Zingales (1998), Nunn (2007), and Buccirossi et al. (2013), among others.

Above, we argued that increased corruption may tighten firms' financial constraints by lowering profits, increasing the likelihood of bankruptcy, increasing uncertainty about future profits, and increasing informational asymmetry between firms (borrowers) and lenders about bribes paid and favors obtained in return. Several of these channels can be at least partially mitigated if borrowers' information is shared more openly and credit markets are more efficient at allocating credit in general. Thus, the presence of credit bureaus and more efficient and freely functioning credit markets can mitigate the negative impact of corruption on SMEs' access to finance.

To provide an example, Blackburn and Sarmah (2006) construct a theoretical model and make several predictions about the impact of corruption and red tape on firms' access to finance. One of their key predictions is that, ceteris paribus, corruption increases the size of loans or financing required by firms to continue operations. As a result, the likelihood of bankruptcy among borrowers rises, and with it, the expected verification cost of financial intermediaries. For these reasons, the authors conclude that corruption exacerbates the inefficiencies of capital market imperfections. In other words, the greater the extent of capital market imperfections, the greater the impact of corruption on tightening financial constraints for firms. The authors are quick to point out that bribery is not the same as other obstacles, such as red tape. Both bribery and red tape raise the cost of doing business, but for different reasons: in the case of red tape, agents must spend

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time and effort on acquiring licenses to carry out the advanced project; in the case of bribery, agents must spend physical and financial resources to obtain these licenses.

Based on the discussion in the preceding paragraphs, we predict that in countries with more developed financial institutions to address asymmetric information problems and other credit market imperfections, the increase in the likelihood of a firm being financially constrained due to higher corruption is smaller. This heterogeneous effect is specific to how corruption affects firms' access to finance and is thus unlikely to hold in the data if our corruption variable was merely a proxy for other omitted factors or if causality ran from financial constraints to corruption. Thus, testing for the heterogeneous effect is a useful way to raise our confidence against omitted variable bias and reverse causality problems. One way of conducting this test is to use financial system elements that can mitigate the asymmetric information problem and other credit market imperfections. Two prominent examples of such elements are the presence of credit bureaus in the country and the degree of freedom with which credit markets are permitted to operate in the country. Thus, the test based on the heterogeneous effect of corruption can be summarized as follows:

Hypothesis 2: The presence of credit bureaus in a country mitigates the positive impact of corruption on the chance or odds of a SME being financially constrained.

Hypothesis 3: More freely functioning credit markets in a country mitigate the positive impact of corruption on the chance or odds of a SME being financially constrained.

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Other tests for endogeneity issues are available. In terms of causal analysis, randomized control trials are the gold standard. Oster (2019) recently proposed a test to determine the severity of the omitted variable bias problem. The test is based on the idea that, under certain assumptions, we can use the selection on observables to identify the likely bias from the selection on unobservables (omitted variables). These methods, however, are not feasible for the purposes of this study. Randomized control trials are not feasible for large samples covering the entire manufacturing sector in 79 countries. Oster's method is limited to linear estimation methods, whereas ours is non-linear (logit).

2.3 *Drivers of firms' financial constraints*

There is substantial literature on the causes of firms' financial constraints. We review this literature in order to motivate the controls used in the regressions.

Several factors influence credit demand and supply at the national or macroeconomic level. Some of these factors may have an effect on firm profitability and, thus, creditworthiness. Others may influence credit provision by influencing how the financial markets operate. Some of the factors mentioned in the literature are historical factors like legal traditions (civil law vs. common law, see Beck et al., 2003) and social capital or trust between people (Guiso et al., 2004); rule of law reflecting quality of property and creditor rights and their effective enforcement (Demirgüc-Kunt and Maksimovic, 1998; Djankov et al., 2008; Liu et al., 2022); presence of credit bureaus and other financial institutions that reduce informational asymmetry between borrowers and lenders (Brown et al., 2009); financial outreach or number of bank branches (Beck et al., 2007); overall economic development or GDP per capita that may aid financial development (Baltagi et al., 2009; Peia and Roszbach, 2015); growth rate of GDP per capita that may reflect growth and

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investment opportunities and therefore the demand for credit; macroeconomic stability (Boyd et al., 2001); quality of the business environment in terms of human capital availability, entry restrictions, labor laws, regulatory burden on firms, tax rates, and competition from informal or unregistered firms that may affect (formal) firms' profitability and therefore the demand for and supply of credit.

Financing requirements and availability may differ by industry. Rajan and Zingales (1998) argue that some industries rely on external finance more than others for technological reasons. They note that the technological reason may be related to differences in initial project scale, gestation period, cash harvest period, and the requirement for ongoing investment. Similarly, growth and profit opportunities may differ by industry, influencing the demand and supply for external finance.

Regarding firm characteristics, smaller and younger firms are more likely to be financially constrained and discouraged from borrowing (Beck et al., 2005; Chavis et al., 2011). Lenders are likely to base their decisions on the firm's current and past performance. Firm performance indicators can be direct, such as the firm's productivity level and growth rate, or indirect, such as the use of modern technology licensed from foreign-owned companies, senior management quality, and possession of internationally recognized quality certification. Access to finance has also been linked to exporting activity, though it is unclear whether exporting causes access to finance to improve or whether firms with better access to finance are more likely to export (Motta, 2020). Firms with foreign ownership have been found to have greater access to finance through domestic and international capital markets (Beck et al., 2013). Some studies have also looked at gender disparities in financial access. Women-owned firms are more likely to be financially constrained than men-owned firms (Aterido et al., 2013; Bardasi et al., 2011; Wellalage et al.,

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2019). Firms that maintain transparency in their financial accounts, such as through independent auditing, are more likely to be able to obtain financing (Claessens, 2006). Firms may also make capital investments to increase their productive capacity. As a result, such firms are more likely to be able to obtain financing (Mckenzie and Woodruff, 2008). Finally, aspects of the business environment may have an impact on firms' current and future performance, and thus, their chances of obtaining financing. Physical infrastructure availability, crime, law and order, business regulations, and competition from informal firms are some of these business environment factors (Aterido et al., 2011; Distinguin et al., 2016; Djankov et al., 2002; Klapper et al., 2006).

3. Data and methods

3.1 *Data description*

The main data source we use is the World Bank Enterprise Surveys (WBES), firm-level survey data collected by the World Bank. The WBES are nationally representative surveys of non-agricultural and non-financial private enterprises with five or more full-time permanent workers. The surveys use a common sampling methodology, stratified random sampling, and a common questionnaire across all countries and times.[2] Stratification is by firm size, industry, and location within the country. Sampling weights are provided in WBES, which we use in all our regressions to ensure that the sample is representative of the country's targeted private sector. We complement the WBES with data from the Fraser Institute's Economic Freedom of the World, the World Bank's World Development Indicators (WDI), Doing Business (DB), Worldwide Governance Indicators (WGI), and the Global Financial Development Database (GFDD).

[2] Details of the sampling methodology and other survey related information are available at www.enterprisesurveys.org

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The sample we use includes all SMEs in the manufacturing sectors in 79 developing countries. We only focus on manufacturing firms because they are more likely to face high levels of corruption (Goel et al., 2021). We follow the definition used by WBES for stratification purposes, whereby SMEs are all firms with fewer than 100 full-time permanent workers. For many countries, multiple rounds of WBES conducted in different years are available. We use this feature of the data for identification purposes by estimating how a change across survey rounds in the level of corruption in a country is correlated with a change in the likelihood of firms being financially constrained. This allows us to control for all time-invariant country-specific factors (via country fixed effects) that are the usual candidates for the omitted variable bias problem. All countries with multiple rounds of WBES are included in our baseline sample. We should emphasize that our sample is a repeated cross-section, not a firm panel. The WBES does not track firms over time, except for a few.

Our baseline regression results are based on a sample of 30,298 SMEs spread across 79 countries, 173 country-year pairs (WBES rounds), and 26 manufacturing industries (at the 2-digit ISIC Rev. 3.1 level). In the online appendix (included with this submission as an Electronic Supplementary Materials file), table A1 contains a list of the countries in the baseline sample as well as the survey years; table A2 contains a formal definition of all the variables used in the regressions; table A3 contains summary statistics for the variables; and table A4 contains summary statistics for the baseline controls separately for the samples of financially constrained and unconstrained firms.

As can be seen from table A1, the WBES data we use is pooled from different years, ranging from 2006 to 2018. We provide a couple of checks to ensure that pooling data across years does not distort our results. First, for 56 out of the 79 countries in our sample, the first WBES

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round was conducted within a relatively short period of 3-4 years (2006-2009), and the same holds for the second WBES round (2010-2013). We confirm that our main results continue to hold if we restrict the sample to these 56 countries. Second, pooling data across years is not a problem provided that the corruption-finance relationship is stable over time. We check this by repeating our main or baseline regressions and adding the interaction term between corruption and time trend. The estimated coefficient value of the interaction term is statistically insignificant, implying that the corruption-finance relationship is relatively stable over time.[3] In addition, all our regressions control for year dummies (Year fixed effects). Thus, our results are unaffected by global annual shocks to the financial constraints of firms or corruption.

Another issue is that the WBES data we use is not a firm panel. That is, firms surveyed in different WBES rounds in a country are not necessarily the same. Thus, our results could be spuriously affected if there are significant differences in the types of firms surveyed in the different WBES rounds in a country and if these differences happen to be correlated with our corruption variable. To check for this possibility, table A5 in the online appendix shows the mean values of some important firm characteristics in the latest WBES round and earlier rounds. The difference between the mean values for each variable is also provided, along with its statistical significance. The firm-level variables considered are defined in detail in a later section and include: real labor productivity (sales per worker, logs), number of workers at the firm (logs), age of the firm (logs), share of exports in total annual sales, proportion of the firm owned by foreign entities, whether the firm has a woman owner or not, whether the firm is part of a larger establishment or not (multi-establishment firm), and industry composition measured by the proportion of firms in the 5 largest industries (at the 2-digit ISIC Rev. 3.1 level) in the sample. Firm characteristics do not differ much

[3] Both the results discussed here are available on request from the authors.

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between the WBES rounds (see table A5). The only statistically significant difference is that firms in the latest WBES round are older by 0.079 log points (significant at the 10 percent level) than in the earlier rounds. However, this difference in the age of the firm between WBES rounds has almost zero correlation with the corresponding difference in the corruption indicators used in the regressions below. Figure 1 illustrates the point. Thus, it is unlikely that our main results below could be spuriously affected by changes in sample composition between WBES rounds in the various countries.

3.2 *Estimation methodology*

Our baseline results are based on the following logistic equation:

$$p(Y_{ijkt} = 1) = \frac{1}{1 + e^{-(\alpha + \beta_1 Corruption_{kt} + CFE_k + YFE_t + IFE_j + Firm\ Controls_{ijk} + Country\ Controls_{kt} + u_{ijkt})}} \quad (1)$$

where the subscript *i* denotes the firm, *j* the industry (at the 2-digit ISIC Rev. 3.1 level), *k* the country where the firm operates, and *t* the year the WBES was conducted. p(.) is the probability of success conditional on the given level of the explanatory variables. *Y* is a dummy variable equal to 1 if the firm is financially constrained and 0 otherwise; *Corruption* is a measure of the level of corruption which varies at the country-year (or WBES round) level; *CFE* is a set of dummy variables for the country where the firm operates (country fixed effects), YFE is a set of dummy variables for the year the ES was conducted (Year fixed effects), and *IFE* is a set of dummy variables for the firm's industry (Industry fixed effects). *Firm controls* include various controls for firm characteristics. *Country controls* include (time-varying) controls for country characteristics,

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and u is the error term. The parameters in equation (1) are estimated by applying maximum likelihood estimation to the following transformed log odds equation:

$$ln\left(\frac{p(Y_{ijkt})}{1-p(Y_{ijkt})}\right) = \alpha + \beta_1 Corruption_{kt} + CFE_k + YFE_t + IFE_j + Firm\ Controls_{ijk} + Country\ Controls_{kt} + u_{ijkt} \quad (2)$$

All regressions use Huber-White robust standard errors clustered at the country-year level.

As discussed above, we go beyond and explore how the relationship between corruption and the financial constraint of the firm depends on country characteristics. This heterogeneity is estimated using the following log odds equation:

$$ln\left(\frac{p(Y_{ijkt})}{1-p(Y_{ijkt})}\right) = \alpha + \beta_1 Corruption_{kt} + \beta_2 Corruption_{kt} * Z_{kt} + \beta_3 Z_{kt} + CFE_k + YFE_t + IFE_j + Firm\ Controls_{ijkt} + Interaction\ Controls_{ijkt} + u_{ijkt} \quad (3)$$

Equation (3) differs from equation (2) in two ways. First, it includes the interaction term between corruption and country characteristics of interest captured by Z. The second difference is that equation (3) includes as controls interaction terms between corruption and several country and firm characteristics. These controls ensure that our main interaction term in the equation (involving corruption and Z variables) is not spuriously picking up the differential impact of corruption

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depending on factors such as income (GDP per capita) and firm size. Like equation (2), equation (3) is estimated using maximum likelihood estimation method.

3.3 *Dependent variable*

The dependent variable is a measure of the financial constraints faced by the firms. The WBES asked each firm if it applied for a loan during the last fiscal year. If a firm did not apply for a loan, it was asked to choose the main reason for not applying from the following list: no need for a loan as the firm has enough internal funds; insufficient loan size and maturity; high collateral requirements; unfavorable interest rate; complex application procedures; and did not think it would be approved. Firms that applied for a loan were asked if the loan application was rejected, still pending, partially approved, or fully approved. This information has been used in studies to identify financially constrained firms (Amin and Soh, 2022; Distinguin et al., 2016; Kuntchev and Ramalho, 2013; Wellalage et al., 2019). We define a firm as *financially unconstrained* either if it did not apply for a loan because it had enough internal funds or if it applied for a loan and the loan amount was approved in full. The remaining firms are classified as *financially constrained.* Thus, financially constrained firms are those that applied for a loan but were either fully or partially rejected, and those that did not apply for a loan for reasons other than having sufficient internal funds (listed above). Formally, the dependent variable in the regressions is a dummy variable equal to 1 if the firm is financially constrained in the way described here and 0 otherwise (*Financially Constrained*). In our baseline sample, 35 percent of the firms are financially constrained. For the median country-year pair in our sample, 29.7 percent of the firms are financially constrained.

One concern with the financially constrained variable is that it does not distinguish between fully and partially constrained firms. A related concern is that grouping partially constrained firms

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with fully constrained firms (or with fully unconstrained firms) is somewhat arbitrary. We address these problems in two ways. First, we check if our results hold using the dependent variable, which equals 1 if the firm is unconstrained, 2 if it is partially constrained, and 3 if it is fully constrained. Partially constrained firms are firms that are financially constrained as defined in the previous paragraph and either have some source of external financing during the year or have had their loan application partially (but not fully) accepted. The remaining financially constrained firms (as defined in the previous paragraph) are fully financially constrained. In our baseline sample, 17.2 percent of the firms are fully constrained, 16.8 percent are partially constrained, and the remaining 65 percent are unconstrained financially. Second, we run the baseline regressions again, but this time we leave out all firms that are only partially financially constrained.

3.4 *Main explanatory variable*

The WBES provides information on specific instances of corruption that firms experienced in conducting six public transactions. These transactions include obtaining an electricity connection, a water connection, a construction permit, an import license, an operating license, and paying taxes. The WBES uses this information to compile two distinct experience-based measures of corruption. The first experience-based measure of corruption is the "incidence of petty corruption," which is defined as a dummy equal to 1 if a firm experienced a bribe payment request in one or more of the six transactions and 0 otherwise. The second experience-based measure of corruption is the "depth of petty corruption." It is defined at the firm-level. It equals the percentage of instance of the public transactions (listed above) in which a firm experienced a bribe payment request.[4] For

[4] These experience-based measures of corruption are available only for firms that solicited the public services previously mentioned. The ES methodology considers a refusal to answer a question on whether bribes were required or requested as an affirmative answer.

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instance, if a firm experienced a bribe payment request in 2 of the 6 public transactions, then the depth of petty corruption equals 2/6 or 33.3 percent.

However, a firm's experience with paying bribes cannot be directly used in the regressions as an explanatory variable because it is likely to be endogenous. That is, paying bribes may be influenced by the firm's financial constraints (reverse causality) and/or correlated with other firm characteristics that impact the financial constraints of the firm (omitted variable bias). Also, there may be measurement errors with reported bribe payments if some firms choose not to respond or misreport. For example, larger SMEs are likely to have a higher ability to pay bribes. Therefore, public officials may target larger SMEs. The financial condition of the firm may also impact the demand for bribes, as cash-rich firms may be targeted by public officials.

One solution suggested in the literature is to proxy the level of corruption experienced by a firm with the average level of corruption experienced by all firms in the same group or cell (Amin and Soh, 2021 and 2022; Paunov, 2016; Distinguin et al., 2016; Aterido et al., 2011; Fisman and Svensson, 2007; Ozler, 2000). The cell can be defined as the country, country-year, industry, or country times industry. Reverse causality from a given firm's financial condition to the average corruption experienced by many firms in a large cell, such as a country-year, is highly unlikely. Similarly, an individual firm's characteristics, such as firm size, age, and the quality of top management, are unlikely to be correlated with the average level of corruption experienced by firms in a large cell. Using the cell average also helps to control for measurement errors since we generally think of these errors as being idiosyncratic to the firm and hence uncorrelated with the group average (see Paunov, 2016; Fisman and Svensson, 2007).

Based on the discussion above, we use the cell averages of the incidence of petty corruption (*Incidence of Petty Corruption*) and the depth of petty corruption (*Depth of Petty Corruption*) as

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our experience-based corruption variables. These are our main explanatory variables. The cell is defined at the country-year (WBES round) level. The term "CY" will refer to the country-year throughout. On average, there are 156 firms in country-year pairs or cells over which the cell average is computed,[5] and the range is 19 to 1,218 firms. The mean value of the *Incidence of Petty Corruption* equals 0.186 (or 18.6 percent), and the standard deviation is 0.157. The corresponding values for the *Depth of Petty Corruption* are 0.15 (or 15 percent) and 0.144, respectively.

The WBES also provides information on a firm's estimate of bribes that firms like itself pay to public officials to "get things done." This measure of overall corruption differs from the petty corruption measures above in two important ways. First, unlike the petty corruption measures that are based on a firm's experience with bribery, the overall corruption measure is based on a much bigger cognitive effort by the firms that involves first thinking of all interactions with the government and then estimating which interactions involved a bribe payment and how much. Second, the overall corruption measure is based on an open question about what is included in "get things done." Thus, it is a noisy measure. For these reasons, we focus on the incidence and depth of petty corruption as our main corruption variables. For robustness, we show that our main result holds if we use the incidence of overall corruption. To this end, we use the country-year level average (cell average) of the dummy variable equal to 1 if the firm reports that firms like itself pay bribes to public officials to "get things done" and 0 otherwise (*Overall Corruption*).

3.5 C*ontrol variables*

While using cell average mitigates the problem of omitted variable bias, there are some lingering concerns. For instance, if firms within cells share common characteristics such as age or size that

[5] The median value of the number of firms in the cell that report on corruption is 85.

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impact the firms' financial constraints, it may lead to an omitted variable bias problem. The country-year average value of corruption may also be correlated with other country characteristics such as the quality of institutions and the rule of law, overall economic development, and macroeconomic growth. The omitted variable bias problem is less severe in our case because in all our regressions we control for country dummies (country fixed effects) and year dummies (year fixed effects). Thus, all time-invariant country-level factors such as the legal origin of countries, the quality of institutions, and overall economic development that are potential candidates for causing omitted variable bias are accounted for in all our regressions. To provide an example, figure 2 shows the relationship between GDP per capita (logs) and the incidence of petty corruption (CY average) with and without controlling for country and year fixed effects. As is evident from the figure, controlling for country and year fixed effects wipes out almost all the correlation between corruption and GDP per capita. A similar result is obtained for the depth of petty corruption. Nonetheless, we control for several firm and country characteristics in our estimations to increase our confidence against the omitted variable bias problem.

Based on the discussion in Section 2.4, in the baseline specification, we control for all time-invariant country-level factors using dummy variables for the country where the firm operates (Country fixed effects). Similarly, all industry-wide factors are controlled for using dummy variables for the industry (2-digit ISIC Rev. 3.1) to which the firm belongs (Industry fixed effects). Annual global shocks to the financial constraints of firms are controlled for using dummy variables for the year the WBES round was conducted (Year fixed effects). The data source for the country, year, and industry fixed effects is WBES. Country-level controls that vary over time include the log of real GDP per capita, the annual growth rate of GDP per capita, and the gross primary

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education enrollment rate, all taken from WDI; the rule of law, which is taken from WGI; and the ease of entry based on the "Starting a Business" indicator, which is taken from the DB project.

The remaining baseline controls are for various firm characteristics and the quality of the business environment and include the following (all taken from WBES): firm size proxied by the log of the total number of permanent full-time workers employed at the firm three fiscal years ago; a dummy equal to 1 if the firm is part of a larger establishment and 0 otherwise (*Multi-establishment Firm*); the log of the age of the firm; the proportion of the firm's annual sales made abroad (*Exports*); the proportion of the firm's ownership that is with foreign individuals and companies (*Foreign Ownership*); a dummy equal to 1 if the firm has one or more female owners and 0 otherwise; a proxy measure of capital use, which is a dummy equal to 1 if the firm purchased fixed assets during the last fiscal year and 0 otherwise[6]; a dummy equal to 1 if the firm's accounts were audited in the last fiscal year and 0 otherwise; the log of (1 plus) total hours of power outages faced by the firm in a typical month over the last fiscal year; a dummy equal to 1 if the firm suffered losses due to crime, theft, and vandalism during the last fiscal year and 0 otherwise; and a dummy equal to 1 if the firm was inspected by tax officials during the last fiscal year and 0 otherwise.

Several other controls are included in the robustness section. These controls include measures of firm performance, additional measures of the business environment at the national and sub-national level, the firm's organizational structure, other firm characteristics, financial development indicators, product market competition, and country size. Due to missing data, there is a significant loss of sample size for some of these controls. As a result, they were not included in the baseline model. For firm performance, we use labor productivity, or the log of the firm's real annual sales in the last fiscal year (deflated and expressed in 2009 USD) divided by the total

[6] Amin and Soh (2021) and Islam et al. (2019) also use this variable as a proxy for capital use.

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number of workers at the firm at the end of the last fiscal year; the annual growth rate of the firm's sales over the last three fiscal years; and the annual growth rate of the firm's labor productivity over the last three fiscal years.

Other firm characteristics we control for include the log of the number of years of industry experience the firm's top manager has (Top Manager Experience); dummy variables indicating the firm's legal status (sole proprietorship, partnership, limited partnership, publicly listed company, privately held limited liability company, and the residual category of all other companies); a dummy variable equal to 1 if the firm was registered when it started operations and 0 otherwise; a dummy variable equal to 1 if the firm uses technology licensed from a foreign company and 0 otherwise; and a dummy variable equal to 1 if the firm has an internationally recognized quality certificate and 0 otherwise. The data source for all these firm-level controls is WBES.

The robustness controls for the sub-national business environment are all taken from WBES and include average values at the country-year-industry level of the following variables: the percentage of the firm's senior management's time spent dealing with business regulations (Time Tax); the severity of high taxes (on a 0-4 scale) as an obstacle to the firm's current operations as reported by the firm; the severity of labor regulation (on a 0-4 scale) as an obstacle to the firm's current operations as reported by the firm; the severity of the lack of proper functioning of courts (on a 0-4 scale) as an obstacle to the firm's current operations as reported by the firm; and a dummy variable equal to 1 if the firm competes against informal sector firms and 0 otherwise. For market competitiveness, we use the Hirschman-Herfindahl Index (HHI) of real annual sales (deflated to 2009 prices and expressed in USD) of the firms reported in the WBES. The index is defined at the country-year-industry level and equals the sum of the square of firms' shares in total sales in a

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country-year-industry cell (see table A2 in the online appendix for more details). The industry is defined at the 2-digit ISIC Rev. 3.1 level (26 industries in our sample).

The remaining robustness controls are defined at the country-year level and include 1-year-lagged values of the following variables: country size proxied by the log of the total population of the country; a broad measure of financial development that equals the private credit to GDP ratio; a dummy variable equal to 1 if there are credit bureaus present in the country and 0 otherwise; and an annual inflation rate based on the consumer price index. The data sources for credit bureau coverage are the World Bank's Doing Business project (DB) and WDI for the remaining country-level variables. Last, we control for the number of bank branches in the country per 100,000 adult population, taken from the GFDD.

Some of our regressions involve estimating how the impact of corruption on firms' financial constraints varies with the level of product market competition, the presence of credit bureaus in the country, the freedom with which the credit market is allowed to function in the country, the regulatory burden on the firms, and power outages. To ensure that these heterogeneities do not spuriously proxy for other possible heterogeneities, we account for other possible heterogeneous effects of corruption depending on overall economic development, infrastructure availability, firm size, entry regulations, and human capital. This is done by using as controls the interaction terms between corruption and the following variables: real GDP per capita (logs); the growth rate of GDP per capita; the primary education enrollment rate; Starting a Business (defined above); firm size or number of workers (logs); and power outages (hours, logs, as defined above).

4. Base regression results

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4.1 *Incidence of petty corruption*

Baseline regression results for the incidence of petty corruption are provided in table 1. The coefficient values shown in panel A are the change in the log odds ratio of success to failure due to a unit increase in the explanatory variables. Success is defined as being financially constrained, while failure means being financially unconstrained. Panel B contains the estimated marginal effect of corruption, or the change in the probability of a firm being financially constrained associated with a unit increase in the level of corruption. In the remainder of the paper, unless stated otherwise, the discussion relates to the estimated log odds ratios as defined here. Throughout, we will refer to the "log odds ratio of success to failure" as simply the "odds of being financially constrained."

The results in table 1 show that a higher incidence of petty corruption is associated with significantly higher odds of being financially constrained. This positive relationship is statistically significant at the 1 percent level in all the specifications. Without any other controls (except for country, year, and industry fixed effects), the estimated coefficient value of the incidence of petty corruption variable equals 1.17 (column 1, panel A). Thus, the odds of being financially constrained increase by 1.17 due to a unit increase in the incidence of petty corruption. The coefficient value becomes larger, equaling 1.33, with all the baseline controls included in the specification (column 5).

The estimated marginal effect of the incidence of petty corruption is also positive, quantitatively large, and statistically significant at the 1 percent level in all the specifications (see panel B in table 1). It ranges between 0.223 and 0.287, or 22.3 and 28.7 percentage points, respectively. Thus, a one standard deviation increase in the incidence of petty corruption is associated with an increase in the probability of a SME being financially constrained by 3.5 to 4.5

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percentage points across the baseline specifications.[7] This is a large effect given that, on average, about 35 percent of the firms are financially constrained.

Regarding the various controls, an increase in firm size (number of workers, logs) is associated with a decline in the odds of being financially constrained (significant at the 1 percent level). The same holds for firms that have purchased assets and are audited. For the macro-level variables, a higher growth rate of GDP per capita and a higher primary education enrollment rate are associated with a significant decline in the odds of being financially constrained. However, the impact of the growth rate of GDP per capita becomes statistically insignificant when all the baseline controls are included in the specification (column 5). Other macro-level variables, including the level of GDP per capita, do not show any significant relationship with the dependent variable. One reason for this could be that country fixed effects absorb some of the effects of macro-level variables. Another possible explanation is the high correlation between macro-level controls. We discover some evidence for these claims. In other words, we ran the final baseline regressions with no country fixed effects and only one macro-level control at a time. Except for the GDP per capita growth rate, all macro-level variables were found to be significantly correlated with the dependent variable and in the expected direction[8].

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4.2 *Depth of petty corruption*

Baseline regression results for the depth of petty corruption are provided in table 2. These results are like the ones discussed above for the incidence of petty corruption. Higher levels of the depth

[7] Alternatively, an increase in the incidence of petty corruption from its smallest value (0) to its highest value (0.7) is associated with an increase in the probability of an SME being financially constrained by 15.6 to 20 percentage points across the baseline specifications.

[8] That is, higher GDP per capita, a higher primary education enrollment rate, a stronger rule of law, and lower entry barriers (the Starting a Business variable) are associated with significantly lower odds of a firm being financially constrained.

of petty corruption are associated with significantly higher odds of being financially constrained. This positive relationship is statistically significant at the 1 percent level in all the specifications (see panel A in table 2). As for the incidence of petty corruption, the estimated coefficient value of the depth of petty corruption increases from 1.46 (column 1) to 1.56 (column 5) when we add the various baseline controls to the specification. Regarding the marginal effect, a unit increase in the depth of petty corruption increases the probability of a firm being financially constrained by 0.279 to 0.339 points (or 27.9 to 33.9 percentage points) across the different specifications (see panel B). Thus, a one standard deviation increase in the depth of petty corruption is associated with an increase in the probability of an SME being financially constrained by 4.0 to 4.9 percentage points across the baseline specifications.[9] This is like what we found for the incidence of petty corruption. The results for the various controls are the same as when using the incidence of petty corruption.

5. Robustness

5.1 *Overall corruption*

We repeat the baseline regression exercise above, replacing petty corruption with *Overall Corruption*. The regression results are provided in table A6 in the online appendix. These results are qualitatively similar to the ones above for the incidence and depth of petty corruption.

5.2 *Additional controls*

[9] Alternatively, an increase in the depth of petty corruption from its lowest to highest value (0 to 0.66) is associated with an increase in the probability of an SME being financially constrained by 18.4 to 22.4 percentage points across the baseline specifications.

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Regression results with the additional controls are provided in table A7 in the online appendix. Columns 1-2 contain results using the incidence of petty corruption, while results using the depth of petty corruption are provided in columns 3-4. Our main result passes the robustness check. That is, the estimated coefficient value of corruption (incidence and depth) remains positive, quantitatively large, and statistically significant at the 1 percent level with the additional controls included. These results hold for the estimated log odds ratios (panel A) and the marginal effects (panel B).

5.3 *Distinguishing between partially and fully financially constrained firms*

Next, we examine if our main result holds when we distinguish between partially and fully financially constrained firms. We conduct two checks here. First, we estimate the relationship between corruption and the dependent variable, which equals 1 if the firm is financially unconstrained, 2 if it is financially partially constrained, and 3 if it is financially fully constrained. The estimation is done using the partial proportional odds (PPO) model (see Williams, 2016). The estimation proceeds in two steps. In the first step, a generalized ordered logit model is estimated without imposing the proportional odds or parallel lines assumption on any of the explanatory variables. The estimation provides an estimate of the deviations from the proportional odds assumption and their statistical significance for each explanatory variable. The second step entails performing a generalized ordered logit estimation with the proportional odds or parallel lines assumption imposed for those explanatory variables that did not violate it in the first step.

Results from the estimation of the PPO model are provided in table A8 in the online appendix. For brevity, only the results for the final baseline specification are shown. Columns 1-2 contain results for the incidence of petty corruption, while columns 3-4 contain results for the

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depth of petty corruption. Note that the proportional odds assumption is not violated for the corruption variables. Thus, the estimated relationship between corruption and the dependent variable does not vary for different values of the dependent variable. The results in table A8 confirm a large and positive relationship between corruption and the odds of a firm being financially constrained. The relationship is statistically significant at the 5 percent level when using the incidence of petty corruption and at the 1 percent level when using the depth of petty Corruption.[10]

For our second check, we repeat the baseline regression results but exclude partially constrained firms from the sample. These results are provided in table A9 in the online appendix. For brevity, results are shown only for some of the specifications. The table shows that our main result of a positive, quantitatively large, and statistically significant relationship between corruption (incidence and depth) and the odds of a firm being financially constrained continues to hold.

5.4 *Variation across countries and WBES rounds*

Our baseline regression results control for country fixed effects. Thus, pure cross-country differences in the level of corruption and financial constraints were excluded from the estimations. In this section, we present results based on variation across survey rounds for a given country as well as across countries. That is, we repeat the baseline regression exercise above but without controlling for the country fixed effects. The sample used here includes 131 countries and 225 country-year pairs (WBES rounds). The sample is larger than the baseline sample (79 countries), as some countries for which only a single round of WBES is available are also included.

[10] Even when we do not apply the proportional odds or parallel lines assumption to the corruption variables, the results are qualitatively similar.

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Regression results are provided in table A10 in the online appendix. These results are qualitatively similar to the baseline results discussed above.

5.5 *Excluding one's firm from the country-year cell average*

Next, we check if excluding one's firm from the country-year cell average for the incidence and depth of petty corruption alters the results in any way. Thus, we repeat the baseline regressions using country-year averages of the corruption variables, with one's firm excluded in computing the average. Regression results are provided in table A11 in the online appendix. They confirm that excluding the own firm from the average does not change the results qualitatively. Even the estimated coefficient values for incidence and depth of petty corruption are almost the same as in the baseline model.

5.6 *Small versus medium firms*

We repeat the baseline regressions separately for the samples of small and medium firms. We follow the definition used by the WBES. Small, and medium firms are those which comprise fewer than 20, and 20 to 99 full-time permanent workers, respectively. Regression results using the incidence of petty corruption are provided in table A12 in the online appendix and in table A13 using the depth of petty corruption. The results show that there is a large and positive relationship between corruption and the odds that a firm is financially constrained, for small as well as medium firms. This relationship is significant at the 1 percent level for small firms. For medium firms, the relationship is significant at the 1 percent level in some specifications and at the 10 percent level in others. Furthermore, the positive relationship between corruption and the odds of being financially constrained is much stronger for small firms than for medium firms. A similar picture

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emerges when we consider the depth of petty corruption (see table A13), although in this case, the relationship between corruption and the odds of being financially constrained for medium firms is statistically significant at the 5 percent level in all the specifications. Qualitatively similar results are obtained for the marginal effects of corruption (incidence and depth).

5.7 *Country-year-industry cell average*

For our next robustness check, we exploit variations in corruption across industries and within country-year pairs. This allows us to control for all time-varying country-level determinants of firms' financial constraints using country-year dummies as controls (Country-year fixed effects). Thus, the corruption variables used here are the average values of incidence and depth of petty corruption reported by the firms in each country-year-industry cell. Industry grouping is at the 2-digit ISIC Rev. 3.1 level (26 industries in our sample).

Regression results for the incidence and depth of petty corruption are provided in table A14 in the online appendix. These results are like the ones discussed above for the baseline model.

5.8 *Product market competition*

Next, we check if the strength of the corruption-finance relationship depends on the level of competition in the firms' product markets. Our prior is that the impact of corruption on firms' financial constraints should be weaker when firms can more easily pass on the cost of higher corruption to consumers. That is, the impact is weaker when there is less competition in the product markets and firms have greater market power.

We test for this prediction using the interaction term between corruption (incidence and depth, separately) and a measure of low vs. high product market competition. For product market

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competition, we first compute the Herfindahl-Hirschman Index of output concentration at the country-year-industry level (formally defined in Section 3.5 and table A2 in the online appendix). We define the dummy variable Low Product Comp to indicate low product market competition. It is equal to one if the Herfindahl-Hirschman Index is above its sample median value of 0.018 and zero otherwise. The baseline specification is used along with the interaction term controls (as listed above).

As predicted, regression results in table 3 reveal that the interaction term between corruption and Low Product Comp is negative and statistically significant at the 5 percent level in one specification and the 1 percent level in the remaining specifications. Thus, our prediction that corruption raises the odds of a firm being financially constrained much more in more competitive product markets is confirmed. To provide an example, consider the specification for the incidence of petty corruption with all the baseline controls included (column 2, table 3). The estimated coefficient value of the incidence of petty corruption equals 0.97 (log odds points) for firms facing low competition (Low Product Comp = 1). The corresponding coefficient value for firms facing high competition (Low Product Comp = 0) is more than twice as large, equaling 2.01. Qualitatively similar results obtain for the depth of petty corruption (see table 3).

For robustness, we repeat the regression exercise in the preceding paragraph using alternative cut-off levels of HHI to define high vs. low product market competition. The alternative cut-off levels are the 25^{th} percentile value of HHI (equal to 0.005) and the 75^{th} percentile value of HHI (equal to 0.045). In the online appendix, regression results using the 25^{th} percentile value of HHI are provided in table A15 and in table A16 using the 75^{th} percentile value of HHI. The results are consistent with previous findings using the median cut-off value of the HHI.

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6. Heterogeneity tests

In this section, we look at how the presence of credit bureaus and freely functioning credit markets affect the impact of corruption on firm financial constraints. As discussed in detail in Section 2.2, these heterogeneities stem from the specific ways in which corruption impacts firms' access to finance. Hence, they serve as useful checks against omitted variable bias and reverse causality concerns. Some evidence confirming that the heterogeneities are specific to corruption is provided below (Section 6.3).

6.1 *Credit bureaus*

For our first heterogeneity test against omitted variable bias and reverse causality problems, we examine how corruption's impact on a firm's financial constraints varies with the presence of credit bureaus in the country (*Hypothesis* 2). For this test, we use the interaction term between corruption and the 1-year lagged values of the dummy variable equal to 1 if the country has credit bureaus and 0 otherwise. The data source for the variable is Doing Business, World Bank. A negative value of the interaction term between corruption and the presence of credit bureaus will confirm *Hypothesis* 2 and help raise our confidence against omitted variable bias and reverse causality concerns with our main result. The baseline specification is used with the interaction term controls (mentioned above) included.

Regression results are provided in table 4. Columns 1-3 contain results for the incidence of petty corruption, while columns 4-6 contain results for the depth of petty corruption. These results confirm our prediction that corruption hinders firms' access to finance much less when there are credit bureaus present in the country. That is, the interaction term between corruption and the dummy for the presence of credit bureaus is negative. It is statistically significant at the 5 percent

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level in most specifications and at the 10 percent level in the remaining specifications. As a result, the first heterogeneity test against reverse causality and omitted variable bias concerns is passed.

6.2 *Freely functioning credit markets*

For our second heterogeneity test against reverse causality and omitted variable bias problems, we examine how the impact of corruption on firms' financial constraints varies with more freely functioning credit markets (*Hypothesis* 3). For this test, we use the interaction term between corruption and the 1 year lagged values of the "Credit Market Freedom" sub-index compiled by the Fraser Institute's Economic Freedom of the World. The sub-index captures the freedom with which credit markets are allowed to function based on the ownership structure of banks (private vs. public), interest rate controls in place, lending rates spread, and the private sector's share of total credit in the country. A higher value of the index implies more freely functioning credit markets. A negative value of the interaction term between corruption and the credit market freedom index will help raise our confidence against reverse causality and omitted variable bias concerns with our main result. The baseline specification is used, with the interaction term controls (mentioned above) included.

Regression results are provided in table 5. Columns 1-3 contain results for the incidence of petty corruption, while columns 4-6 contain results for the depth of petty corruption. These results confirm our prediction that corruption hinders firms' access to finance much less when credit markets operate more freely. That is, the interaction term between corruption and the credit market freedom index is negative and large. It is statistically significant at the 10 percent level in one specification and at the 5 percent level in the remaining specifications, including the final one. As a result, the heterogeneity test is passed.

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6.3 *Falsification tests*

The validity of the heterogeneity tests against reverse causality and omitted variable bias problems discussed in Sections 6.1 and 6.2 rests on the assumption that the impact of corruption's covariates on a firm's financial constraint is not moderated by credit bureaus and more freely functioning credit markets (see Section 2.2). In this section, we provide some evidence to support this assumption.

As pointed out by Blackburn and Sarmah (2006), more red tape raises the cost of conducting business, but it does not affect financial market outcomes. Thus, unlike corruption, there is no evident reason why the impact of more red tape on the likelihood of being financially constrained should be less positive (or more negative) in countries with credit bureaus and more freely functioning credit markets. However, if our corruption variable is a proxy for red tape or the stringency of business regulations, then we should find similar effects for red tape as we did for corruption in Sections 6.1 and 6.2. The argument can be extended to other aspects of the business environment, such as power outages.

Based on the discussion above, the falsification tests we employ entail repeating the regression exercise of Sections 6.1 and 6.2 but substituting, one by one, a measure of red tape and power outages faced by firms for corruption. Our main measure of red tape is the "Freedom from Regulation" sub-index compiled by the Fraser Institute's Economic Freedom of the World. Note that higher values of the index imply more freedom and therefore less red tape. Thus, the falsification test is passed if the interaction term between the Freedom from Regulation index and the financial development indicators (presence of credit bureaus and more credit market freedom) is not significantly positive. For robustness, we use two other measures of red tape obtained from

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WBES. These include the country-year level average of the dummy variable equal to 1 if the firm was inspected by tax officials and 0 otherwise, and the country-year level average of the percentage of the firm's senior management's time spent dealing with government regulations (Time Tax). Since higher values of both alternative measures of red tape imply more red tape, the falsification test is passed if the interaction term between these measures of red tape and the financial development indicators is not significantly negative. Going beyond the red tape, we conduct a similar falsification test for power outages. This falsification test is passed if the interaction term between power outages and financial development indicators is not significantly negative. Power outages here equal the log of the country-year level average of (1 plus) the total hours of power outages experienced by the firms in a typical month over the last year.

Regression results for the falsification test involving our main measure of red tape, Freedom from Regulation, are provided in table 6. For brevity, only some of the specifications are shown. We find no evidence that the impact of red tape on firms' financial constraints depends on the presence of credit bureaus or the degree of credit market freedom. That is, the interaction term between the Freedom from Regulation index and the presence of credit bureaus is negative and statistically insignificant. The relationship between the Freedom from Regulation index and the Credit Market Freedom Index is positive but statistically insignificant. Thus, the first falsification test is passed.

Results for the remaining measures of red tape (visits and tax officials, time tax) and power outages are provided in tables A17 to A19 in the online appendix. Recall that for all these variables, the falsification test is passed if their interaction term with financial development indicators (credit bureau presence, capital market freedom) is not significantly negative. This is indeed the case for inspections and visits by tax officials (table A17). For time tax, we do find that its interaction term

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with the dummy for the presence of credit bureaus and the capital market freedom index is negative and significant in some of the specifications. Similarly, in some specifications, the interaction term for the power outage variable with the presence of a credit bureau is negative and significant. However, these significant interaction terms become weak and statistically insignificant (at the 10 percent level) when we include the basic control for the differential effect of time tax and power outages depending on GDP per capita (that is, when we control for the interaction term between time tax and power outages and GDP per capita) and/or other interaction term controls (see columns 3 and 6 in table A18, column 3 in table A19). Thus, unlike corruption, we find no robust evidence that the impact of red tape or power outages is mediated through the presence of credit bureaus or the degree of financial market freedom. The falsification tests are therefore passed.

7. Conclusion

Corruption is a major economic issue in emerging and developing economies, and it can have a wide range of consequences for SMEs. We investigated how corruption affects the financial constraints of manufacturing SMEs using nationally representative survey data from 79 developing countries. Our findings suggest that corruption increases the likelihood of financial constraints for manufacturing SMEs. The increase is less pronounced in countries with credit bureaus and more freely functioning credit markets, which help to mitigate credit market imperfections caused by asymmetric information between borrowers and lenders and uncertainty about returns on capital. The level of competition in the product markets is also important, with corruption having a greater negative impact on SMEs' financial constraints in more competitive product markets. Overall, corruption can stifle SMEs' growth and development by tightening their financial constraints and

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limiting their economic contribution. As a result of our findings, the case for anti-corruption policies that protect SMEs becomes stronger.

To convert policy intervention potential into actual policies, several steps must be taken. Perhaps the most immediate step is to identify the types of anti-corruption policies that are best suited for combating the corruption faced by SMEs. Anti-corruption policies are broadly classified as follows (see Gans-Morse et al., 2018): rewards and penalties (for bureaucrats); monitoring; restructuring bureaucracies; screening and recruiting of bureaucrats; establishment of anti-corruption agencies; educational campaigns; and international agreements. A minimum salary (reward) for bureaucrats, according to the literature, is necessary but not sufficient for combating corruption. Monitoring bureaucrats and their actions has been shown in several studies to reduce corruption. However, there is little evidence that other anti-corruption policies are effective. The problem is exacerbated by the fact that SMEs differ from other firms in terms of visibility, sunk costs, and profitability, all of which are important determinants of bribery's incidence and intensity. As a result, determining the most effective anti-corruption strategy for SMEs is a critical task for future policymakers and researchers.

Several other critical issues remain to be explored. First and foremost, the current paper focuses on bureaucratic corruption. Other forms of corruption are also significant, such as lending practices and judicial corruption. Some research has looked at how these types of corruption affect firms' access to finance. However, the role of credit bureaus, more freely functioning credit markets, and other aspects of financial development in mitigating the effects of corruption remains unknown. Second, data constraints prevent us from fully understanding how corruption affects SMEs' access to finance. For example, how much corruption affects SMEs' access to finance by lowering future profits rather than increasing uncertainty about future profits will be interesting to

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see. Which of these or other mechanisms prevails is likely to determine the best policy response to the negative impact of corruption on SMEs. Third, issues of corruption may have ramifications for the types of financial instruments used by borrowers and lenders, the types of financial intermediaries used by borrowers, and the use of "soft information" vs. "hard information" in the lending process. Changes on these and other fronts could help mitigate the negative impact of corruption on SMEs' access to finance. Future research in this area is critical. Fourth, our findings show that the negative effect of higher corruption on SMEs' access to finance can be magnified by policies that increase competition in the product markets. This suggests that anti-corruption and competition-enhancing policies should be complementary. More research is required to confirm or refute this viewpoint. Fifth, when policymakers are unable to reduce corruption, our findings suggest an alternative. By establishing credit bureaus and improving the efficiency of credit markets, it is possible to mitigate at least some of the negative impact of corruption on SMEs' access to finance. Future research can further investigate this possibility and apply the findings to other elements of financial development.

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Figure 1: Change in corruption and age of the firm (logs) across WBES rounds

Figure 1A: Incidence of petty corruption

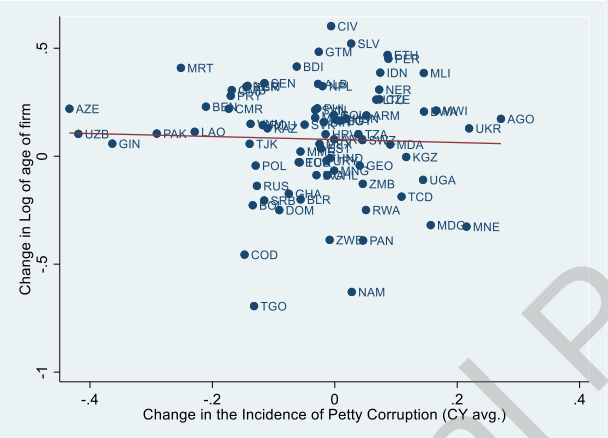
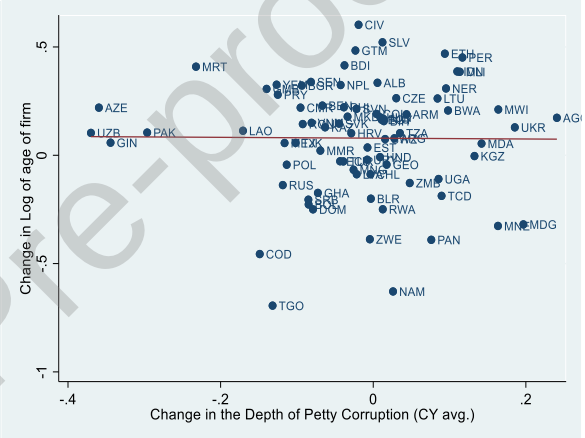


Figure 1B: Depth of petty corruption



Notes: The relationship shown in the two figures is statistically insignificant at the 10 percent level or less. The horizontal axis measures the change in average age of the firm (log values) in the latest WBES round in the country and the earlier rounds. The horizontal axis measures a similar change in the incidence of petty corruption (figure 1A) and the depth of petty corruption (figure 1B). Sample size: 79 countries.

Source: Authors’ calculations using data from World Bank Enterprise Surveys data, World Bank.

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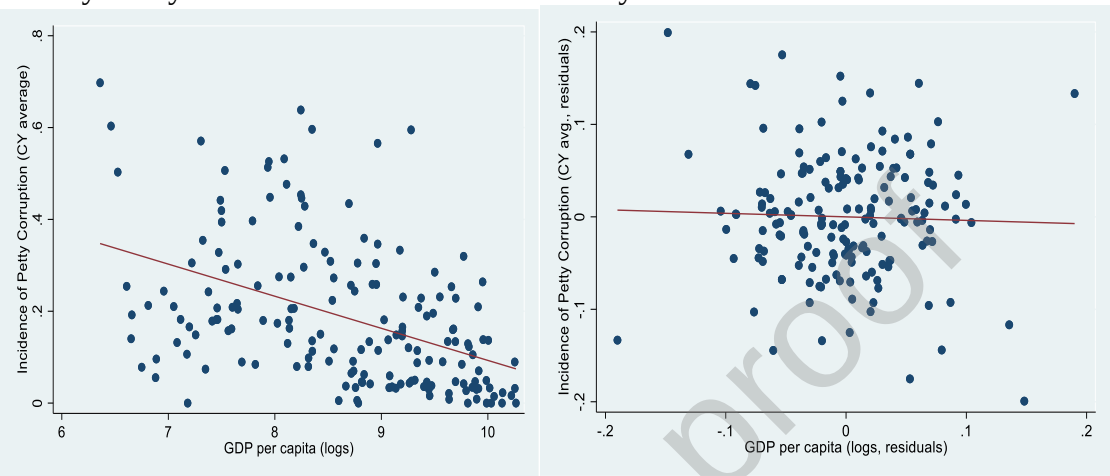
Figure 2: Incidence of Petty Corruption (CY average) and GDP per capita

Figure 2A: Without controlling for country and year dummies

Figure 2B: Controlling for country and year dummies



The residuals in Figure 2B are obtained from OLS regression of the variable (Incidence of Petty Corruption, GDP per capita) on all the country dummies and year dummies.
Source: Authors' calculations using Enterprise Surveys and World Development Indicators, World Bank.

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Table 1: Incidence of Petty Corruption

Dependent variable: Financially Constrained Y:1 N:0	(1)	(2)	(3)	(4)	(5)
Panel A: Log-odds ratios from logit estimation					
Incidence of Petty Corruption (CY avg.)	1.165*** (0.427)	1.520*** (0.437)	1.286*** (0.457)	1.299*** (0.456)	1.334*** (0.461)
Number of workers (logs)		-0.285*** (0.035)	-0.223*** (0.038)	-0.224*** (0.038)	-0.223*** (0.038)
GDP per capita (logs, real)		0.086 (0.477)	0.036 (0.490)	0.075 (0.486)	0.254 (0.536)
Growth rate of GDP per capita (%, annual)		-0.023** (0.011)	-0.020* (0.011)	-0.019* (0.011)	-0.017 (0.011)
Primary Education Enrollment Rate		-0.005*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)	-0.005*** (0.002)
Age of Firm (logs)			0.038 (0.048)	0.033 (0.048)	0.032 (0.048)
Exports (proportion of sales)			0.071 (0.176)	0.073 (0.178)	0.071 (0.178)
Firm Has Female Owners Y:1 N:0			-0.059 (0.065)	-0.065 (0.064)	-0.065 (0.064)
Foreign Ownership (proportion)			-0.047 (0.130)	-0.046 (0.130)	-0.049 (0.130)
Firm Purchased Assets Y:1 N:0			-0.474*** (0.064)	-0.486*** (0.063)	-0.486*** (0.064)
Firm is Audited Y:1 N:0			-0.362*** (0.074)	-0.362*** (0.073)	-0.361*** (0.073)
Multi-establishment Firm Y:1 N:0			-0.072 (0.090)	-0.074 (0.091)	-0.073 (0.091)
Power Outages (hours, logs)				0.037 (0.024)	0.037 (0.024)
Firm Experienced Losses from Crime Y:1 N:0				0.120 (0.075)	0.121 (0.075)
Firm Inspected/Visited by Tax Officials Y:1 N:0				-0.051 (0.067)	-0.051 (0.067)
Rule of Law					-0.183 (0.249)
Starting a Business					-0.005 (0.004)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	3.094*** (0.586)	2.957 (3.530)	3.162 (3.650)	2.866 (3.620)	1.470 (4.113)

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Number of observations	30,298	30,298	30,298	30,298	30,298
Panel B: Marginal effects					
Incidence of Petty Corruption (CY avg.)	0.223***	0.287***	0.239***	0.241***	0.247***
	(0.082)	(0.082)	(0.085)	(0.085)	(0.085)

Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

Table 2: Depth of Petty Corruption

Dependent variable: Financially Constrained Y:1 N:0	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Panel A: Log-odds ratios from logit estimation					
Depth of Petty Corruption (CY avg.)	1.455***	1.798***	1.500***	1.514***	1.557***
	(0.490)	(0.497)	(0.520)	(0.517)	(0.523)
Number of workers (logs)		-0.285***	-0.223***	-0.224***	-0.223***
		(0.035)	(0.038)	(0.038)	(0.038)
GDP per capita (logs, real)		0.110	0.055	0.094	0.271
		(0.474)	(0.488)	(0.484)	(0.531)
Growth rate of GDP per capita (%, annual)		-0.023**	-0.020*	-0.019*	-0.017
		(0.011)	(0.011)	(0.011)	(0.011)
Primary Education Enrollment Rate		-0.005***	-0.005***	-0.005***	-0.005***
		(0.002)	(0.002)	(0.002)	(0.002)
Age of Firm (logs)			0.038	0.033	0.033
			(0.048)	(0.048)	(0.048)
Exports (proportion of sales)			0.073	0.074	0.073
			(0.176)	(0.178)	(0.178)
Firm Has Female Owners Y:1 N:0			-0.060	-0.065	-0.065
			(0.064)	(0.064)	(0.064)
Foreign Ownership (proportion)			-0.046	-0.045	-0.048
			(0.130)	(0.130)	(0.130)
Firm Purchased Assets Y:1 N:0			-0.473***	-0.484***	-0.485***
			(0.064)	(0.064)	(0.064)
Firm is Audited Y:1 N:0			-0.362***	-0.362***	-0.361***
			(0.074)	(0.073)	(0.073)
Multi-establishment Firm Y:1 N:0			-0.071	-0.074	-0.072
			(0.090)	(0.091)	(0.090)
Power Outages (hours, logs)				0.037	0.037
				(0.024)	(0.024)
Firm Experienced Losses from Crime Y:1 N:0				0.122	0.122
				(0.075)	(0.075)
Firm Inspected/Visited by Tax				-0.050	-0.050

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Officials Y:1 N:0				(0.067)	(0.067)
Rule of Law					-0.178
					(0.250)
Starting a Business					-0.005
					(0.004)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	3.114***	2.817	3.059	2.760	1.397
	(0.585)	(3.502)	(3.630)	(3.595)	(4.070)
Number of observations	30,298	30,298	30,298	30,298	30,298
Panel B: Marginal effects					
Depth of Petty Corruption (CY avg.)	0.279***	0.339***	0.279***	0.281***	0.289***
	(0.094)	(0.093)	(0.096)	(0.096)	(0.097)

Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

Table 3: Interaction with Low Product Comp

Dependent variable: Financially Constrained Y:1 N:0	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Incidence of Petty Corruption			**Depth of Petty Corruption**		
Corruption (CY avg.)*Low Proudct Comp (dummy)	**-1.244*** **	**-1.039*** **	**-1.228*** **	**-1.246*** **	**-1.038** **	**-1.286*** **
	(0.408)	**(0.399)**	**(0.408)**	**(0.432)**	**(0.426)**	**(0.421)**
Corruption (CY avg.)	2.009***	2.009***	11.240**	2.301***	2.234***	14.526***
	(0.453)	(0.493)	(4.627)	(0.534)	(0.572)	(5.112)
Low Product Comp (dummy)	0.148	0.167	0.202*	0.103	0.130	0.173
	(0.116)	(0.117)	(0.119)	(0.110)	(0.111)	(0.112)
Number of workers (logs)		-0.221***	-0.149**		-0.222***	-0.173***
		(0.038)	(0.058)		(0.038)	(0.054)
GDP per capita (logs, real)		0.336	0.462		0.332	0.499
		(0.544)	(0.557)		(0.541)	(0.568)
Growth rate of GDP per capita (%, annual)		-0.014	-0.023		-0.014	-0.023
		(0.011)	(0.023)		(0.011)	(0.022)

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Primary Education Enrollment Rate	-0.005***	-0.002	-0.005***	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age of Firm (logs)	0.033	0.030	0.032	0.029
	(0.048)	(0.048)	(0.048)	(0.048)
Exports (proportion of sales)	0.069	0.053	0.071	0.059
	(0.178)	(0.180)	(0.178)	(0.180)
Firm Has Female Owners Y:1 N:0	-0.062	-0.062	-0.063	-0.063
	(0.064)	(0.064)	(0.064)	(0.064)
Foreign Ownership (proportion)	-0.044	-0.049	-0.043	-0.048
	(0.130)	(0.130)	(0.130)	(0.129)
Firm Purchased Assets Y:1 N:0	-0.484***	-0.485***	-0.483***	-0.484***
	(0.064)	(0.064)	(0.064)	(0.064)
Firm is Audited Y:1 N:0	-0.364***	-0.363***	-0.364***	-0.361***
	(0.073)	(0.073)	(0.073)	(0.073)
Multi-establishment Firm Y:1 N:0	-0.069	-0.061	-0.068	-0.062
	(0.091)	(0.091)	(0.091)	(0.091)
Power Outages (hours, logs)	0.037	0.038	0.037	0.032
	(0.024)	(0.038)	(0.024)	(0.034)
Firm Experienced Losses from Crime Y:1 N:0	0.122	0.117	0.124*	0.119
	(0.075)	(0.074)	(0.075)	(0.074)
Firm Inspected/Visited by Tax Officials Y:1 N:0	-0.052	-0.046	-0.050	-0.043
	(0.067)	(0.068)	(0.067)	(0.068)
Rule of Law	-0.183	-0.207	-0.178	-0.214
	(0.246)	(0.266)	(0.248)	(0.271)
Starting a Business	-0.005	-0.004	-0.005	-0.002
	(0.004)	(0.007)	(0.004)	(0.006)
Corruption (CY avg.)*GDP per capita (logs, real)		-0.940		-1.336**
		(0.601)		(0.673)
Corruption (CY avg.)* Primary Education Enrollment Rate		-0.009		-0.006
		(0.009)		(0.009)

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Corruption (CY avg.)* Starting a Business			0.001 (0.021)			-0.004 (0.022)
Corruption (CY avg.)*Power Outages (hours, logs)			-0.002 (0.161)			0.018 (0.159)
Corruption (CY avg.)*Number of workers (logs)			-0.361 (0.221)			-0.300 (0.243)
Corruption (CY avg.)*Growth rate of GDP per capita (%, annual			0.051 (0.051)			0.067 (0.053)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.941*** (0.585)	0.742 (4.181)	-0.670 (4.282)	2.997*** (0.588)	0.848 (4.147)	-0.799 (4.344)
Number of observations	30,298	30,298	30,298	30,298	30,298	30,298

All coefficient values are log odds ratios obtained from logit estimation. Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

Table 4: Interaction with Credit Bureau present dummy

Dependent variable: Financially Constrained Y:1 N:0	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Incidence of Petty Corruption			**Depth of Petty Corruption**		
Corruption (CY avg.)* Credit Bureau Present (dummy)	**-1.595** (0.643)**	**-1.594** (0.643)**	**-1.425* (0.767)**	**-1.984*** (0.753)**	**-1.975*** (0.757)**	**-1.517* (0.919)**
Corruption (CY avg.)	1.763*** (0.530)	1.968*** (0.540)	6.550 (4.442)	2.182*** (0.592)	2.317*** (0.588)	8.887* (4.920)
Credit Bureau Present (dummy)	0.386** (0.151)	0.368** (0.163)	0.335** (0.168)	0.382*** (0.141)	0.369** (0.153)	0.308* (0.164)
Number of workers (logs)		-0.224*** (0.038)	-0.146** (0.059)		-0.224*** (0.038)	-0.170*** (0.054)
GDP per capita (logs, real)		0.399 (0.519)	0.338 (0.538)		0.467 (0.516)	0.411 (0.547)

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Growth rate of GDP per capita (%, annual)	-0.019*	-0.016	-0.019*	-0.018
	(0.011)	(0.023)	(0.011)	(0.022)
Primary Education Enrollment Rate	-0.005***	-0.002	-0.005***	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Age of Firm (logs)	0.033	0.031	0.033	0.030
	(0.048)	(0.048)	(0.048)	(0.048)
Exports (proportion of sales)	0.071	0.058	0.074	0.065
	(0.178)	(0.180)	(0.178)	(0.180)
Firm Has Female Owners Y:1 N:0	-0.067	-0.067	-0.068	-0.067
	(0.064)	(0.064)	(0.064)	(0.064)
Foreign Ownership (proportion)	-0.052	-0.054	-0.052	-0.054
	(0.131)	(0.130)	(0.131)	(0.130)
Firm Purchased Assets Y:1 N:0	-0.488***	-0.490***	-0.488***	-0.488***
	(0.064)	(0.064)	(0.064)	(0.064)
Firm is Audited Y:1 N:0	-0.357***	-0.359***	-0.357***	-0.357***
	(0.073)	(0.073)	(0.073)	(0.073)
Multi-establishment Firm Y:1 N:0	-0.074	-0.068	-0.073	-0.069
	(0.091)	(0.091)	(0.090)	(0.090)
Power Outages (hours, logs)	0.037	0.041	0.037	0.034
	(0.024)	(0.038)	(0.024)	(0.034)
Firm Experienced Losses from Crime Y:1 N:0	0.121	0.117	0.122	0.118
	(0.075)	(0.075)	(0.075)	(0.075)
Firm Inspected/Visited by Tax Officials Y:1 N:0	-0.053	-0.050	-0.052	-0.047
	(0.067)	(0.067)	(0.067)	(0.067)
Rule of Law	-0.279	-0.229	-0.285	-0.243
	(0.265)	(0.279)	(0.263)	(0.279)
Starting a Business	-0.003	-0.005	-0.003	-0.003
	(0.004)	(0.007)	(0.004)	(0.007)
Corruption (CY avg.)* GDP per capita (logs, real)		-0.377		-0.649
		(0.593)		(0.661)
Corruption (CY avg.)* Primary Education Enrollment Rate		-0.011		-0.010
		(0.010)		(0.009)

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Corruption (CY avg.)*Starting a Business			0.009			0.003
			(0.021)			(0.023)
Corruption (CY avg.)* Power Outages (hours, logs)			-0.020			0.008
			(0.157)			(0.155)
Corruption (CY avg.)* Number of workers (logs)			-0.391*			-0.337
			(0.222)			(0.243)
Corruption (CY avg.)* Growth rate of GDP per capita			-0.004			0.013
			(0.054)			(0.058)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.935***	0.002	0.244	2.919***	-0.505	-0.229
	(0.601)	(4.019)	(4.144)	(0.601)	(3.985)	(4.189)
Number of observations	30,298	30,298	30,298	30,298	30,298	30,298

All coefficient values are log odds ratios obtained from logit estimation. Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

Table 5: Interaction with Credit Market Freedom

Dependent variable: Financially Constrained Y:1 N:0	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Incidence of Petty Corruption (CY avg.)			Depth of Petty Corruption (CY avg.)		
Corruption (CY avg.)*Credit Market Freedom (EFW)	**-0.589***	**-0.539****	**-0.808****	**-0.746****	**-0.645****	**-0.780****
	(0.327)	**(0.268)**	**(0.393)**	**(0.339)**	**(0.279)**	**(0.396)**
Corruption (CY avg.)	5.298*	5.070**	2.014	6.473**	5.705**	5.086
	(2.730)	(2.228)	(5.465)	(2.813)	(2.303)	(6.073)
Credit Market Freedom (EFW)	0.042	-0.006	0.031	0.047	-0.008	-0.003
	(0.072)	(0.063)	(0.073)	(0.066)	(0.058)	(0.064)

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Number of workers (logs)	-0.229***	-0.138**	-0.229***	-0.164***
	(0.041)	(0.061)	(0.041)	(0.057)
GDP per capita (logs, real)	1.052*	1.394***	1.037*	1.400**
	(0.571)	(0.536)	(0.567)	(0.560)
Growth rate of GDP per capita (%, annual)	-0.009	-0.027	-0.006	-0.027
	(0.013)	(0.021)	(0.013)	(0.021)
Primary Education Enrollment Rate	-0.005***	-0.004	-0.005***	-0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
Age of Firm (logs)	0.055	0.058	0.055	0.058
	(0.046)	(0.046)	(0.046)	(0.046)
Exports (proportion of sales)	0.051	0.030	0.049	0.031
	(0.180)	(0.181)	(0.180)	(0.181)
Firm Has Female Owners Y:1 N:0	-0.065	-0.069	-0.067	-0.070
	(0.068)	(0.067)	(0.068)	(0.067)
Foreign Ownership (proportion)	-0.071	-0.071	-0.072	-0.074
	(0.140)	(0.140)	(0.140)	(0.139)
Firm Purchased Assets Y:1 N:0	-0.527***	-0.531***	-0.528***	-0.530***
	(0.066)	(0.066)	(0.066)	(0.066)
Firm is Audited Y:1 N:0	-0.349***	-0.350***	-0.350***	-0.348***
	(0.075)	(0.075)	(0.075)	(0.075)
Multi-establishment Firm Y:1 N:0	-0.084	-0.072	-0.083	-0.074
	(0.092)	(0.092)	(0.092)	(0.092)
Power Outages (hours, logs)	0.019	0.042	0.019	0.030
	(0.024)	(0.036)	(0.024)	(0.033)
Firm Experienced Losses from Crime Y:1 N:0	0.138*	0.133*	0.137*	0.131*
	(0.077)	(0.076)	(0.077)	(0.076)
Firm Inspected/Visited by Tax	-0.026	-0.029	-0.027	-0.028

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Officials Y:1 N:0		(0.068)	(0.068)		(0.068)	(0.067)
Rule of Law		-0.437*	-0.540**		-0.434*	-0.540**
		(0.235)	(0.238)		(0.234)	(0.246)
Starting a Business		0.003	-0.004		0.003	-0.001
		(0.005)	(0.008)		(0.005)	(0.008)
Corruption (CY avg.)*GDP per capita (logs, real)			0.634			0.187
			(0.725)			(0.851)
Corruption (CY avg.)* Primary Education Enrollment Rate			-0.007			-0.005
			(0.010)			(0.009)
Corruption (CY avg.)*Starting a Business			0.024			0.019
			(0.023)			(0.022)
Corruption (CY avg.)* Power Outages (hours, logs)			-0.111			-0.065
			(0.154)			(0.149)
Corruption (CY avg.)* Number of workers (logs)			-0.493*			-0.427
			(0.253)			(0.279)
Corruption (CY avg.)* Growth rate of GDP per capita (%, annual			0.031			0.063
			(0.048)			(0.050)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.144	-6.716	-9.563**	1.192*	-6.501	-9.355**
	(0.757)	(4.398)	(4.175)	(0.697)	(4.398)	(4.339)
Number of observations	29,326	29,326	29,326	29,326	29,326	29,326

All coefficient values are log odds ratios obtained from logit estimation. Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

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Table 6: Falsification test using Freedom from Regulation index

Dependent variable: Financially Constrained Y:1 N:0	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Freedom from Regulation (EFW)*Credit Bureau Present (dummy)	**-0.103**	**-0.200**	**-0.185**			
	(0.149)	**(0.141)**	**(0.170)**			
Freedom from Regulation (EFW)*Credit Market Freedom (EFW)				**0.066**	**0.043**	**0.088**
				(0.078)	**(0.058)**	**(0.081)**
Freedom from Regulation (EFW)	0.011	0.094	0.582	-0.460	-0.123	0.482
	(0.185)	(0.149)	(0.912)	(0.657)	(0.473)	(1.076)
Credit Bureau Present (dummy)	1.005	1.675*	1.433			
	(1.088)	(1.010)	(1.190)			
Credit Market Freedom (EFW)				-0.517	-0.457	-0.688
				(0.519)	(0.400)	(0.535)
Number of workers (logs)		-0.227***	0.102		-0.228***	0.091
		(0.041)	(0.310)		(0.041)	(0.310)
Age of Firm (logs)		0.057	0.055		0.058	0.056
		(0.046)	(0.046)		(0.046)	(0.046)
Exports (proportion of sales)		0.046	0.038		0.048	0.041
		(0.179)	(0.182)		(0.180)	(0.183)
Firm Has Female Owners Y:1 N:0		-0.067	-0.057		-0.069	-0.058
		(0.068)	(0.068)		(0.068)	(0.068)
Foreign Ownership (proportion)		-0.066	-0.068		-0.068	-0.071
		(0.140)	(0.142)		(0.140)	(0.143)
Firm Purchased Assets Y:1 N:0		-0.530***	-0.527***		-0.525***	-0.524***
		(0.066)	(0.066)		(0.066)	(0.066)
Firm is Audited Y:1 N:0		-0.351***	-0.343***		-0.351***	-0.342***
		(0.075)	(0.076)		(0.075)	(0.076)
Multi-establishment Firm Y:1 N:0		-0.081	-0.084		-0.083	-0.084
		(0.092)	(0.092)		(0.092)	(0.092)
Firm Experienced Losses from Crime Y:1 N:0		0.139*	0.133*		0.140*	0.135*
		(0.077)	(0.078)		(0.077)	(0.078)
Firm Inspected/Visited by Tax Officials Y:1 N:0		-0.029	-0.024		-0.030	-0.025
		(0.067)	(0.068)		(0.067)	(0.068)
GDP per capita (logs, real)		1.119*	2.145***		1.359**	2.588***
		(0.591)	(0.762)		(0.588)	(0.762)

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Growth rate of GDP per capita (%, annual)		0.001	-0.391***		0.001	-0.433***
		(0.014)	(0.115)		(0.013)	(0.131)
Rule of Law		-0.324	-0.402*		-0.496**	-0.497*
		(0.227)	(0.231)		(0.250)	(0.266)
Starting a Business		-0.000	-0.123***		0.000	-0.109***
		(0.006)	(0.028)		(0.006)	(0.030)
Primary Education Enrollment Rate		-0.005***	0.013		-0.005***	0.013*
		(0.002)	(0.008)		(0.002)	(0.008)
Power Outages (hours, logs)		0.020	0.331*		0.018	0.330*
		(0.024)	(0.183)		(0.024)	(0.181)
Freedom from regulation (EFW)*GDP per capita (logs, real)			-0.210*			-0.259**
			(0.110)			(0.110)
Freedom from regulation (EFW)*Primary Education Enrollment Rate			-0.003**			-0.003**
			(0.001)			(0.001)
Freedom from regulation (EFW)*Number of workers (logs)			-0.050			-0.048
			(0.045)			(0.045)
Freedom from regulation (EFW)*Starting a Business			0.020***			0.018***
			(0.004)			(0.005)
Freedom from regulation (EFW)*Growth rate of GDP per capita (%, annual)			0.058***			0.064***
			(0.018)			(0.020)
Freedom from regulation (EFW)*Power Outages (hours, logs)			-0.047*			-0.047*
			(0.029)			(0.028)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.297	-7.608	-8.599	5.073	-6.763	-8.142
	(1.394)	(4.699)	(5.874)	(3.896)	(5.044)	(6.803)
Number of observations	29,323	29,323	29,323	29,323	29,323	29,323

All coefficient values are log odds ratios obtained from logit estimation. Huber-White robust standard errors clustered on country-year in brackets. *** (1%), ** (5%), * (10%).

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Highlights

- Impact of bureaucratic corruption on SMES' access to finance is estimated.
- Firm-level survey data on 79 developing countries are used.
- Corruption adversely affects SMEs' access to external finance.
- Credit bureaus and strong financial institutions soften the impact of corruption.
- More product market competition makes corruption more harmful to SMEs' finances.

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